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A VALIDITY STUDY  
OF THE  
NAVY INSTRUCTOR ATTITUDE INVENTORY

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## ABSTRACT

The Navy Instructor Attitude Inventory (NIAI) was developed for measuring those attitudes of instructors believed to be factors in the ability of instructors to effect desirable, harmonious relationships in their classrooms. An account of the development of the NIAI is presented.

Data from a sample of seventy instructors are utilized in two validation analyses. One analysis involves multiple regression; the other analysis involves linear discriminant functions. In both analyses a continuous externally defined criterion is used. The criterion is a composite of ratings made by students and by an educational specialist who had been supervising the seventy instructors.

Two prediction equations and four classification equations are presented and their derivations indicated. These equations are verified on the group or groups from which they were derived. Suggestions are made for cross-validation and possible application. Some advantages of the discriminatory technique over multiple regression are described and illustrated. Other comparisons of the two techniques of analysis are also given.

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## INTRODUCTION

This report deals with a continuation of the attempt to measure the ability of a military instructor to effect harmonious interpersonal relations in the classroom. A previous attempt had been made to measure this ability by using the Minnesota Teacher Attitude Inventory (MTAI) in a naval school setting, with inconclusive results (2). The rationale for using MTAl scores as measures of this ability to establish harmonious interpersonal classroom relations was based on the development of the instrument and subsequent validation studies with it (1). The results of these studies indicated that the MTAl could predict the nature of teacher-student relations in the classroom about as well as academic achievement can be predicted by means of intelligence tests (1).

The use of the MTAl as predictor of harmonious interpersonal classroom relations in a naval school is discussed elsewhere (2). The conclusion at that time was that, for the group of instructors under investigation, the MTAl was not a significant predictor of the criteria.

The hypothesis was then advanced that those attitudes of the instructors in the naval school which were measured by the MTAl were not the attitudes most relevant to the creation and maintenance of harmonious interpersonal relations in a naval or military school situation. It seemed advisable, therefore, to try to determine those attitudes which are related to the creation and maintenance of such relations, create a scale or inventory based on the attitudes so related, and to make a study of its effectiveness.

Accordingly, a new scale was drawn up. This scale, known as the Navy Instructor Attitude Inventory (NIAI) consisted originally of 300 items. Ninety of these items were selected by empirical methods from the MTAl (form BX) and from the TAI (form CX) both of which had been used in the previous validation study (2). The empirical method used in selecting these items was as follows: The MTAl answer sheets of the group of instructors at the naval school were broken down into upper and lower groups (upper 50% and lower 50% of the N) based on the criteria. An item analysis of the MTAl was then run and those items which were found to discriminate at the 20% level of confidence or better, between the upper and lower criterion groups were selected for use in the NIAI. Also, certain MMPI items which seemed to discriminate between the upper and lower groups were selected and rewritten for the five-category-type response which the MTAl items used and which the NIAI items would also use.

Additional items were written and chosen on logical bases for measuring those attitudes which the investigators felt contributed to harmonious relations in a naval school. For example, analysis of the validation study using the MTAl as a predictor (2) gave some indication that there was a positive relationship between how "good" an instructor was (in terms of how highly the combined criteria rated him) and the amount of formal schooling the instructor had had. This led to the hypothesis that if the "good" instructor had had pleasant school experiences and the "poor" instructor had less pleasant ones, then it might be possible to construct items, based on known reasons why people dropped out of school, which would separate those instructors who had gone on in school from those who had dropped out. In other words, such items might be one way of discriminating between "good" and "poor" instructors on an attitudinal basis. Thus, items based on past school history and experiences were constructed and included in the NIAI on a logical basis for the reasons just given.

Once the new inventory was drawn up, the next step was a study of the effectiveness of the NIAI with a group of instructors in a naval school.

### Procedure

#### Administration of Inventory and Obtaining the Criterion Data

This study, like the previous one, was conducted in the Airman School (Class P) of the Naval Air Technical Training Center at Jacksonville, Florida. The inventory (NIAI) was administered to a sample of 70 marine and navy instructors. These instructors were non-commissioned

officers, most of whom had been instructing in the school about two years. They were advised that their scores on the NIAI would in no way affect their status, that this was part of a study of the personal attitudes and characteristics of instructors in a military school. Most of the group seemed cooperative and can be assumed to have made conscientious efforts to complete the inventory properly. However, there were a few who objected to this extra call on their time, and these few may not have responded to the NIAI as requested.

As a criterion measure, the student questionnaire, referred to elsewhere (2, Appendix A), was administered to the student trainees in each of the instructor's classes. A few classes had known their instructors for only about 10 hours. For this reason, some of the students' questionnaires might not be as valid and reliable evaluations as those of the educational specialist who had known the instructors for a much longer time.

Further criterion data in the form of a rating of each of the instructors by the civilian educational specialist in the school were obtained. Additional data were obtained involving variables which might prove helpful and illuminating in the study. They will be cited later on. The rating of each instructor by his immediate supervisor and the evaluation of the instructor by an observer in the classroom were not obtained as criterion measures for this preliminary analysis as they were in the study involving the MTAI as a predictor due to time limitations (2).

#### Development of Content Scales

Before any validity analysis was made, it was decided that the items of the NIAI should be grouped and classified into separate scales. This was done by the pooled judgment of five consultants on the project. The rationale for the assignment of items to subscales was as follows: Items that were judged to deal with attitudes of the instructors towards various school or classroom situations were grouped into a teacher attitude (TA) scale. These items were mostly the MTAI items selected for the NIAI because of previous empirical evidence (3). Items judged to deal with attitudes towards situations that may have occurred in the past school history of the instructor were grouped into a past school experiences (PSE) scale; items judged to deal with the personal adjustment of the instructor (mostly Minnesota Multiphasic Personality Inventory type items) were grouped into a general adjustment (GA) scale (5).

#### Development of Verification Scales

It was decided to construct a scale based on statistical rarity of responses. A complete item count in terms of item difficulty was run on every response category of every original NIAI item. This item count, plus data on responses obtained in the first three validation studies of the MTAI and response data from the previous study at the Airman School (2) were used as the bases. This scale, called a verification (V) scale, was not necessarily a content scale but was considered similar to the F scale on the MMPI, the V scale on the Kuder Preference Record, and the V scale on the MTAI.

Included in this scale were any and all item response categories of the NIAI which had been chosen by 10% or less of the instructors in the present and three previous samples. This V scale was subsequently subdivided into three components: (1) The V+, or rare positive response (RPR) scale, (2) the V-, or the rare negative response (RNR) scale, and (3) the Vo, or rare neutral response scale. The V+ or rare positive response (RPR) scale finally evolved as a suppressant-type predictor variable in the multiple regression problem. The V- scale was retained as a verification scale, and the Vo was dropped.

Finally, it was decided to adapt the L scale of the MMPI for use as another verification scale.

In summary the verification scales and number of items in each are as follows:

1. The L scale from the MMPI -- 15 items.
2. The V- or RNR scale -- 142 items.

3. The V+ or RPR scale -- 48 items.

Use of the verification scales will be discussed in a subsequent section.

Keying the Inventory

As with the item selection, the keying of the items was done by joint effort of the consultants on the project, Drs. Robert Callis, Kenneth Brown, John Ferguson, and Guy Renzaglia and Mr. Arthur Krasner. The keying of each item was on a judgmental basis where the consultants utilized the empirical evidence such as the distribution of responses on this study in terms of item difficulty, and discrimination evidence based on responses to items now in the NIAI which had been part of the previous study at the naval school (2). Certain items were discarded when it was felt that the evidence was not sufficiently clear to indicate keying.

Accordingly, the GA, TA and PSE scales were keyed as indicated above, where any one response category in an item could be scored either plus one, minus one, or zero, depending on the empirical evidence and the agreement of the consultants after taking the evidence into consideration.

The keying for the V scales, which were based on frequency of response, was taken directly from keying of the same item and response categories on the content scales of the NIAI which had already been keyed. After this was done, it was then decided to break the V scale into three components as mentioned earlier. This was done to see how many of the item response categories were keyed as plus one, as minus one, and as zero. The V+ scale thus consisted of all V items keyed as plus one, the V- scale of all items keyed as minus one and the Vo scale of all items keyed as zero.

The L scale was keyed for five responses instead of for two as in the MMPI. This results in a much lower mean and smaller standard deviation in the NIAI than in the MMPI. It should be noted that in this scale the response categories can be keyed only as plus one.

Rationale of the Use of the Verification Scales

Experience has shown that most examinees are conscientious and make a sincere effort to respond to examinations as directed. However, there are some individuals who will in some instances deliberately attempt to distort test results. This is especially likely when the subjects are coerced into taking the examinations, and even more so if the tests are personality or attitude inventories.

The verification scales were incorporated in the NIAI for the sole purpose of detecting those few individuals who deliberately try to distort the test results. It is conceivable that some individuals will rush through a test marking items without reading them. Scores for such test behavior will approximate chance scores. Since there is very little overlap of the chance and real scores in either Table 1 or Table 2, such behavior can be rather definitely identified.

Another possibility would be for a subject to attempt to put himself in a very bad light by marking "negative" attitude responses rarely admitted by persons conscientiously marking the test. Such behavior would result in a very high V- score, approaching or exceeding the chance score on that scale. Unless the score exceeded chance, there would be no way of distinguishing it from the haphazard marking of the test without reading the items. But, it would make little difference which it is, for in either case all of the subject's scores would be too suspect for use and should be declared invalid anyway.

The L scale of the NIAI contains the same items as the L scale of the Minnesota Multiphasic Personality Inventory. Thus, it can be interpreted in a similar manner (5).\* A high score

\*However, since five alternatives rather than two were used, the mean and standard deviation of the L scores here are lower than on the MMPI.

on the L scale indicates haphazard answering of the items, perhaps without reading, or the claim to righteous attitudes which are extremely rare among normal people conscientiously responding to the inventory.

TABLE 1

NAVY INSTRUCTOR ATTITUDE INVENTORY: L SCALE  
REAL AND CHANCE SCORES

RS	Real		Chance Centile
	f	Centile	
9	1	100.	
8	1	98.7	50.0*
7*	0	97.2	41.3
6	1	97.2	22.0
5	1	95.8	9.1
4	4	94.4	3.0
3	5	88.7	0.8
2	15	81.5	
1	20	60.1	
0	22	31.5	

\*The chance mean is 7.4; the S. D. is 1.81. The distribution is based on probability calculations.

TABLE 2

NAVY INSTRUCTOR ATTITUDE INVENTORY:  
RARE NEGATIVE RESPONSE (V-) SCALE  
REAL AND CHANCE SCORES

RS	Real		Chance Centile
	f	Centile	
48-50*	0		50.0*
45-47	1	100.	41.0
42-44	0	98.7	21.4
39-41	0	98.7	8.7
36-38	0	98.7	2.7
21-23	1	98.7	
18-20	4	97.2	
15-17	5	91.5	
12-14	6	84.4	
9-11	13	75.8	
6- 8	14	57.2	
3- 5	17	37.2	
0- 2	9	12.9	

\*The chance mean is 48.2; the S. D. is 5.29. The distribution is based on probability calculations.

Thus, it is suggested that the testing be declared invalid for individuals who have raw scores higher than three on the L scale or higher than 20 on the V- scale.

The V+ scale was originally a verification scale too, but from the regression analysis it was found to be a good predictor variable. Its function as a predictor seems to be that of a

"suppressant" (7).\* On the V+ scale a cutting score of eight (two standard deviations high) can be used to indicate invalid answering of the inventory.

#### The Variables and the Correlation Matrix

The six variables of the NIAI (excluding the L scale) were to be used as independent variables in a multiple regression problem for predicting the combined criterion. The six NIAI independent variables were: TA, GA, PSE, and the three V scales. The dependent variable, combined criterion, was the sum of standard scores obtained from the ratings made by the educational specialist and the mean of student ratings for each instructor.

Ten additional variables of secondary importance were included to produce a 16 x 16 correlation matrix (Table 3). These ten variables are of interest as aids to interpreting the six primary variables and the criteria. Attention is called to the fact that in Table 3 some of the data are incomplete, e.g., Arithmetic Test Scores were available for only 34 of the 70 subjects. The 16 variables of Table 3 are as follows:

1. The Criterion of the multiple regression problem. This variable was obtained by summing the standard scores for each individual on the educational specialist's ratings and the mean of students' ratings. (N = 70)
2. Teacher Attitude (TA) Scale, (N = 70) ( $r_{11} = .75$ )\*\*
3. General Adjustment (GA) Scale, (N = 70) ( $r_{11} = .81$ )
4. Past School Experience (PSE) Scale, (N = 70). ( $r_{11} = .91$ )
5. V Plus (V+) Scale, (N = 70) ( $r_{11} = .82$ )
6. V Minus (V-) Scale, (N = 70) ( $r_{11} = .86$ )
7. V Zero (Vo) Scale, (N = 70) ( $r_{11} = .84$ )
8. L Scale from the MMPI (N = 70) ( $r_{11} = .53$ )
9. Educational Specialist's Ratings of instructors expressed in standard scores (N = 70). This is one of the two components of the criterion (variable No. 1).
10. Student Ratings of instructors expressed in standard scores (N = 70). This is the other component of the criterion variable.
11. General Classification Test (GCT) Scores (N = 68)
12. Mechanical Aptitude Test Scores (N = 67)
13. Arithmetic Test Scores (N = 34)
14. Age of the Instructors (N = 69)

\*If in a prediction battery of tests, one separate named test is a "suppressant", sometimes students learn of this one test which received a negative weight and deliberately try to make very poor scores on that one test. Since the V+ of the NIAI is not a separate test which examinees can identify, there is no such danger in using it here.

\*\*All reliability coefficients reported here were estimated by the Rulon split-half technique (8).

TABLE 3  
CORRELATION MATRIX\*

Variable	2	3	4	5	6	7	1	8	9	10	11	12	13	14	15	16	M	SD
2. Teacher Attitude (TA) Scale	31	36	15	-51	-5	25	03	24	09	18	08	13	20	01	07	04	10	
3. General Adjustment (GA) Scale	65	26	-70	-32	23	09	21	09	03	12	07	08	-08	-03	09	11		
4. Past School Experience (PSE) Scale	23	-81	-33	26	13	28	06	13	03	19	12	17	-03	16	10			
5. V Plus (V+) Scale	-05	39	-12	54	-04	-12	14	23	01	04	06	-33	02	C3				
6. V Minus (V-) Scale	61	-31	12	-26	-08	02	-01	-12	-13	05	-10	09	07					
7. V Zero (Vo) Scale	-22	43	-22	-14	09	08	-01	01	00	00	-10	05	04					
1. Combined Criteria	00	67	67	08	07	25	-01	10	09	100	13							
8. L Scale		07	-08	07	13	09	-04	09	-10	02	02							
9. Educational Specialist's Ratings		-10	19	03	35	15	20	12	50	10								
10. Student Ratings			-08	05	-10	-16	-07	-01	50	10								
11. General Classification Test (GCT) Scores				40	75	-72	24	03	117	10								
12. Mechanical Aptitude Test Scores					33	-03	01	-12	118	12								
13. Arithmetic Test Scores						-04	25	27	113	12								
14. Age of the Instructors							-01	20	30	06								
15. Years of Schooling								-18	12	01								
16. Months on Staff of the Airman School									22	09								

\*Decimal points have been omitted.

- |                            |   |              |
|----------------------------|---|--------------|
| r of .24 sig. at .05 level | { | for 68 d. f. |
| r of .31 sig. at .01 level | { |              |
| r of .34 sig. at .05 level | { | for 32 d. f. |
| r of .44 sig. at .01 level | { |              |

15. Years of Schooling (N = 69)

16. Months on Staff of the Airman School (N = 68)

It may be of interest to note that none of the variables outside of the NIAI group correlate higher than 0.20 with the criterion except the Arithmetic Test Scores. It will be recalled that the number of cases for which Arithmetic Test Scores were available was only 34; hence, the coefficient of 0.25 between the criterion and Arithmetic Test Scores is not significant at the 5% level of confidence. It is of special interest that neither the criterion nor any of the NIAI variables seem to be very much related to the GCT scores or any of the other aptitude measures (with the possible exception of the Arithmetic Test Scores just mentioned).

Two of the NIAI variables fall short of 5% level of confidence correlations with the criterion (GA and V+). Only one of the six NIAI variables (V-) has a correlation coefficient with the criterion which is significant at the 1% level.

#### ANALYSIS -- Part I

##### The Multiple Regression Problem

With an N of only 70, with criterion correlations of doubtful significance, and with the inter-correlations of the independent variables relatively high in most instances, it was with reservation that a multiple regression problem was attempted. However, since there seemed an outside chance that the work might at least be indicative of what could be expected from a larger sample, the problem was attempted.

As previously stated, the six scales of the NIAI were the independent variables for predicting the combined ratings criterion. With these six variables a multiple R of 0.383, which is just short of significance at the 5% level, was obtained. Significance tests of the betas for each of the six variables revealed two variables, Vo and V-, which were contributing very little to the multiple correlation. Hence, it was decided to repeat the problem using only four independent variables,

TABLE 4  
THE BETA COEFFICIENTS FOR THE SIX VARIABLES

Variables	TA	GA	PSE	V+	V-	Vo
Betas	.181	.112	.168	-.177	.043	-.091

TA, GA, PSE and V+. This produced a multiple correlation of 0.379, for which the level of significance is between the one and five per cent levels.

TABLE 5  
DATA ON THE MULTIPLE REGRESSION PROBLEM

Variables	TA	GA	PSE	V+	Criterion	X	s	$\beta_{rc}$
TA	1.0000	.3068	.3584	.1541	.2456	4	10	.0450
GA	.3068	1.0000	.6468	.2624	.2288	9	11	.0289
PSE	.3584	.6468	1.0000	.2258	.2588	16	10	.0418
V+	.1541	.2624	.2258	1.0000	-.1243	2	3	.0276
Betas	.183	.126	.162	-.222	N = 70			R <sup>2</sup> = .1433
b	.247	.154	.202	-.953	r <sub>.05</sub> = .236			R = .379
					r <sub>.01</sub> = .306			.05 > p > .01

Table 5 presents the correlation matrix with the coefficients carried to four places. The beta multiplications which, when summed, yield  $R^2$  are given; each product shows the proportion of accounted-for variance the respective variable contributes. The unrounded b-coefficients, regression indices, are presented for the reader who might be concerned with how much influence the rounding may have had on the formula for obtaining weighted total scores which are discussed subsequently.

#### Interpretation

The standard error of estimate for the prediction equation is 12.03. The error of estimate is large in relation to the standard deviation of the criterion. The forecasting efficiency is only about 7.5%. Also, because of the small sample used, the expected "shrinkage" is great. After "shrinkage" the coefficient is estimated to be about 0.30.

The reliability of the criterion is unknown, but surely it is much lower than for any of the NIAI predictor scales. However, since the reliability of the criterion is not known, the unreliability of the criterion cannot be safely blamed for producing a low multiple correlation coefficient.

#### Suggestions for Application

Until another more conclusive validation study on the NIAI is done, applications of the instrument should be limited to experimental programs. Obviously, many other factors should be considered when selecting instructors for Navy AN (P) Schools. However, with all other considerations equal, instructor candidates with high-weighted total scores on the NIAI (subsequently defined) should be preferred to those with low-weighted total scores. An alternate approach to the study and application of the NIAI which seems to hold good promise will be the topic of the second part of this analysis and will be presented subsequently.

#### The NIAI Profile Sheet

Table 6 summarizes a very large portion of the data available on the NIAI. In fact, since the NIAI Profile Sheet is not being recommended for other than experimental application, it is for this purpose of summarizing the data that it is presented here.

Reading from left to right across the top of Table 6 are the NIAI Scales: L; V-; V+; Teacher Attitude (TA); General Adjustment (GA); Past School Experience (PSE); and the Weighted Total.

The columns at either side of the Profile Sheet are scaled for Z-scores.\* Each scale of the NIAI was converted to Z-scores and plotted on the Profile Sheet. Thus, the Profile Sheet serves as both a table of normative data and a conversion table for each of the NIAI scales. The raw scores for each scale appear in the column under the name of the scale, however for TA, GA, and PSE, 50 points have been added to each raw score. The Z-score conversion is made by first finding the particular raw score to be converted, adding 50 to the raw score, and moving either to the left or to the right margin of the Profile Sheet and reading the value at that height in the Z-scale column. For example, suppose one wanted to convert a GA raw score of 30 to a standard Z-score. First add 50 to the raw score of 30, then looking in the column of GA scores find the score of 80. Moving directly across the sheet to the margin one finds a 70 at the same height on the profile in the Z-score column. Thus, for a GA raw score of 30, the corresponding Z-score is 70.

The NIAI Weighted Total Score represents the best combination of the four predictors for predicting the criteria used in this study (See Table 5). It is found by the following formula:

$$.25 \text{ TA} + .15 \text{ GA} + .20 \text{ PSE} - (\text{V}+) + 66 = \text{The Weighted Total Score.}$$

The raw scores of the predictors as they appear on the profile, are used in the formula. These Weighted Total Scores are also plotted on the profile.

\* $Z = 10_z + 50$ .  $\bar{Z} = 50$ .  $s_Z = 10$ .

TABLE 6  
NIAI PROFILE SHEET

Z Score	L	V-	V+	TA*	GA*	PSE*	Weighted Total	Z Score
-100		- 45 -						100 -
	10	-	16					
		- 40 -	15					
-90	9	-	14					90 -
	8	- 35 -	13					
-80	7	-	12	- 85 -				80 -
	6	- 30 -	11	- 80 -				
		-	10	- 75 -	- 85 -			
		-	9	-	-			
-70	5	- 25 -	8	- 75 -	-	- 80 -	- 109 -	70 -
		-	7	-	-	-		
	4	- 20 -	6	-	- 75 -	- 80 -		
-60	3	-	5	- 65 -	-	-		60 -
		- 15 -	4	-	- 70 -	- 75 -	- 104 -	
	2	-	3	- 60 -	- 65 -	-		
		-	3	- 55 -	- 70 -	-		
-50	1	-	2	-	- 60 -	- 65 -	- 99 -	50 -
	0	- 5 -	1	- 50 -	- 55 -	-		
-40		-	0	- 45 -	- 50 -	- 60 -		40 -
		-	0	- 40 -	- 45 -	- 55 -	- 94 -	
-30				- 35 -	- 40 -	- 50 -		30 -
				-	- 35 -	- 45 -	- 89 -	
-20	Chance Mean is 7.4	Chance Mean is 48.2	Chance Mean is 9.8	- 30 -	- 30 -	- 40 -		20 -
	S.D. = 1.8	S.D. = 5.3	S.D. = 2.8					
	(Two-thirds of the chance scores should fall) within brackets)			*50 points have been added to each raw score.				

## ANALYSIS -- Part II

### The Classification Problem

An alternate approach to application of the NIAI would be to shift the emphasis from measurement and prediction along a continuum to that of classification of a designated proportion of the available pool of instructors into a dichotomy of acceptable and unacceptable applicants. This phase of the analysis focuses upon investigation of the potentialities of the NIAI as a selection device when used in conjunction with a classification equation (discriminant function). When the same criterion is used and only two criterion groups are involved, the discriminant functions and multiple regression equations may be expected to yield approximately the same results (9). In this special case discriminant scores may be used to rank individuals according to the estimate of the degree of success each will attain on the job. And, predicted scores from a multiple regression equation may be used to classify individuals into either of two groups by use of a cutting score. Thus, in the special case of two groups, choice of the two methods may devolve to practical matters of flexibility and amenability to the kinds of criteria available.

Discriminant analysis permits the use of criteria not readily amenable to multiple regression work. Also, discriminant analysis, as a working technique, is highly flexible in that several combinations of criteria can be tried with a minimum of additional labor. This follows from the fact that once the reciprocal dispersion matrix is found, all that is needed for obtaining different classification equations are the different sets of differences between means for the differently defined criterion groups. Changes in the criterion definition when doing multiple regression problems requires new sets of correlation coefficients which are much more laborious to obtain than the mere differences between pairs of means.

Thus, the classification problem suggested here is to find a suitable classification equation for use with NIAI scores making the NIAI a selection device in which a decision to accept or reject an applicant would be made on the basis of whether or not the discriminant score for the applicant exceeds a certain value.\* Some classification results using multiple regression will be presented to demonstrate the comparability of the technique to discriminant functions with two groups and identical criteria. Some special advantages of discriminatory analyses will be discussed.

### Multiple Regression Data and Classification

By application of the multiple regression equation presented in the Analysis, Part I, to the 70 cases of this study, the weighted total scores (predicted criterion scores) for each of the 70 instructors are found. By selecting the median predicted score (100.05) as a cutting point the 70 cases can be divided into halves. Then, selecting the upper half, a count can be made to determine what percentage of these cases which were above the median predicted score are also above the median criterion rating. This percentage may be taken as the percentage of correct classification, which is 66% for these data. Setting the cutting point is arbitrary. In this case it was set to select one of every two applicants available. Any other point could be chosen. For example, if the top one-third of this sample is chosen on the basis of predicted criterion scores, using the score of 102.4 as the cutting point, 74% of this top one-third is found also to exceed the median on the combined criterion. In the analyses which follow it will be shown that even this percentage of correct classification can be exceeded.

### First Classification Equation

This first attempt using the linear discriminant function was chosen to simulate the conditions of classification by use of multiple regression data. In theory, the results should be approximately the same, and as depicted in Table 8, the results are very much the same.

\*This is in no way to preclude the application of other criteria when selecting instructors.

The first classification equation\* or discriminant function is as follows:  
 $.806 \text{ TA} + 1.000 \text{ GA} + .836 \text{ PSE} - 1.736 \text{ V+} = \text{Discriminant Score I.}$

All seven test scores and the three criterion scores for each individual were put on 3" x 5" cards. The 70 cards were sorted into two equal piles. One pile was comprised of all individuals whose combined criterion ratings were above the median; the other pile was comprised of all those below the median combined criterion rating. Hereinafter, those 35 cards for individuals whose combined ratings were higher than the median will be called the Upper 35 Group; the 35 cards for the remainder will be called the Lower 35 Group.

The means on the four variables (TA, GA, PSE, and V+) for the Upper 35 Group and for the Lower 35 Group were run through the classification equation to obtain group discriminant scores. The arithmetic mean of the two group discriminant scores was computed and used as the cutting score for classifying individuals into either the Upper 35 Group or the Lower 35 Group. Then, the 70 cards, one for each instructor in the sample, were used to obtain discriminant scores for each individual and hence to classify them into the two groups. Table 7 summarizes the data of this paragraph. It is noted that the overall percentage of correct classification is 66, the same as was

TABLE 7  
EXPECTANCY TABLE FOR FIRST CLASSIFICATION EQUATION

Discriminant Score	Criterion		Correct Classification
	Below Median	Above Median	
Over 153.34	14	25	64%
Below 153.34	21	10	68%
Correct Classification	60%	71%	Total 66%

obtained using a prediction index with the multiple regression equation. However, it appears that the cutting score is too low, resulting in 39 being selected and only 31 rejected. If the cutting score is adjusted upward to the median for the 70 cases, the expectancy table becomes balanced, exactly as it was with multiple regression (See Table 8).

TABLE 8  
ADJUSTED EXPECTANCY TABLE FOR FIRST CLASSIFICATION EQUATION

Discriminant Score	Criterion		Correct Classification
	Below Median	Above Median	
Over Median	12	23	66%
Below Median	23	12	66%
Correct Classification	66%	66%	Total 66%

#### Multiple Regression and the Purified Criterion

In the previous discussion of the verification scales it was stated that according to the criteria recommended here for declaring certain cases invalid, some of the cases used in this study

\*The first classification equation was computed by using the inverse of the intercorrelation matrix, first dividing the differences between means by their respective roots of the sums of the squared deviations ( $\sqrt{\sum x^2}$ ). Then the solutions to the equations were again divided by respective roots of sums of squared deviations ( $\sqrt{\sum x^2}$ ) to obtain discriminant function coefficients (4). One of these coefficients (GA) was set to equal unity and all the others changed to maintain proportionality. It should be noted that the inverse matrix and all the basic data used were available from the regression analysis.

should be ejected from the study for invalid testing. The criteria were applied and six cases were declared invalid. Three of the six were rated above the median combined criterion rating and three were rated below. As hypothesized, both the prediction equation and the classification equation did poorly with these six cases. Hence, it is assumed that inclusion of these six cases actually contaminated the sample, that to remove them would, in effect and to some degree, purify the criterion. But these six could not be identified until after the scores were processed so they were retained in the major body of the study. Now the six cases are being removed and certain parts of the study repeated to see what influences these invalid cases had on the results.

Also, it was noted that the V+ distribution was severely skewed, that a large portion of the variation was resulting from a very small portion of the sample so the V+ variable, except as a verification scale, is dropped from the study at this point.

Another regression analysis was made using the three variables (TA, GA, and PSE, predicting combined criterion) and the 64 remaining cases. The multiple regression equation is as follows:

$$.31 \text{ TA} + .02 \text{ GA} + .26 \text{ PSE} + 65 = \text{Second Weighted Total Score.}$$

Table 9 summarizes the results.

TABLE 9

DATA ON SECOND MULTIPLE REGRESSION PROBLEM

Variables	TA	GA	PSE	Criterion	$\beta_{rc}$
TA	1.0000	.3065	.2993	.2951	.0690
GA	.3065	1.0000	.5716	.1958	.0034
PSE	.2993	.5716	1.0000	.2666	.0497
Betas	.234	.017	.187	N = 64 r.05 = .243 r.01 = .316	R <sup>2</sup> = .1221 R = .35 .05 > p > .01
b	.311	.022	.263		

Then, following the same procedure as before in utilizing multiple regression data for classification, the overall assignment to groups was found to classify 69% correctly. Table 10 is the four-fold expectancy table for these data.

TABLE 10

EXPECTANCY TABLE FOR SECOND MULTIPLE REGRESSION EQUATION

Predicted Score	Criterion		Correct Classification
	Below Median	Above Median	
Over 101.6	10	22	69%
Below 101.6	22	10	69%
Correct Classification	69%	69%	Total 69%

The Second Classification Equation

Again, the multiple regression data were employed to obtain another classification equation for the three variables and 64 cases. However, correlation coefficients were not used; thetas ( $\sum x^2$ 's and  $\sum xy$ 's) were used instead. The reciprocal theta matrix was obtained and used for this and all the following discriminant equations. The advantage of using the theta matrix derives from the fact that differences in means may be used directly without having to make adjustments with respective roots of sums of deviations ( $\sqrt{\sum x^2}$ ).

The following classification equation was obtained:  
 $1.00 \text{ TA} + .558 \text{ GA} + .336 \text{ PSE} = \text{Discriminant Score II}$ .  
 Application of the equation produced the results portrayed in Table 11.

TABLE 11  
 EXPECTANCY TABLE FOR SECOND CLASSIFICATION EQUATION

Discriminant Score	Criterion		Correct Classification
	Below Median	Above Median	
Over 109.31	11	24	69%
Below 109.31	21	8	72%
Correct Classification	66%	75%	Total 70%

Tables 10 and 11 may be compared. Overall, there is not much to choose between them. The discriminant function seems to do a better job in classifying individuals who are rated above the median than it does in classifying those rated below the median on the criterion. No credence, except to note as a possible trend, should be awarded this difference because with this small sample the difference is not statistically significant.

#### The Third Classification Equation

Without removing either variables or cases and without having to use a different inverse matrix, another device for improving the criterion would be to apply the Kelley split (6). Since the criterion is a single continuous variable, the scheme is to rank all cases on the criterion and to select the upper and lower 27% divisions of the group for contrasting. This is the technique commonly used in item analysis work and there seems to be no evidence that it would not be applicable here. This was done on the 64 cases, yielding two groups of 17 cases each. Their differences in means were run through the reciprocal theta matrix and the following discriminant equation obtained:

$$1.000 \text{ TA} + .286 \text{ GA} + .891 \text{ PSE} = \text{Discriminant Score III.}$$

Applying the above equation to all 64 cases the results of Table 12 evolved.

TABLE 12  
 EXPECTANCY TABLE FOR THIRD CLASSIFICATION EQUATION

Discriminant Score	Criterion		Correct Classification
	Below Median	Above Median	
Over 129.17	12	26	68%
Below 129.17	20	6	77%
Correct Classification	62%	81%	Total 72%

Again it is noted that the discriminant function did a better job with those rated above than with those rated below the combined criterion. The trend is stronger than before but still short of statistical significance. With just the 34 cases of the two criterion groups this trend was still stronger and the overall correct classification was 79%. The correct classification for those scoring above the median was 88%.

#### The Fourth Classification Equation

One other attempt was made to purify the criterion on the same three variables, the same 64 cases, and the same inverse theta matrix. The rationale for this was that rather than use the combined criterion as such, individuals would be selected who were above the median on both the

student and educational specialist's ratings to be contrasted to those who were below the median on both criteria. This resulted in two groups of 13 cases each. The classification equation resulting from this arrangement was as follows:

$$1.000 \text{ TA} + .719 \text{ GA} + .669 \text{ PSE} = \text{Discriminant Score IV.}$$

Application of the equation to the 64 cases yielded a table with expectancies exactly the same as those in Table 12, hence the table is not presented. A check was made to determine whether or not the same cases comprised the two tables. It was found that four cases of the 64 were switched -- two up and two down.

The overall correct classification for the 26 cases of the criterion groups was 85%. The table was perfectly balanced; 2 and 11, 11 and 2.

#### Interpretation

Specific interpretation has accompanied the presentation of each classification equation.

By way of general interpretation it appears that the discriminant functions used tended to do a better job classifying individuals rated above the criterion median than classifying those below the median. This is interpreted to indicate that the higher-rated instructors are a more homogeneous lot than the lower-rated instructors. That is to say, there are fewer ways to be an effective instructor than ways to be an ineffective instructor -- effective in the sense of ability to promote desirable harmonious interpersonal relationships in the classroom. There is no conclusive evidence for this, so it must be regarded as a hypothesis.

#### Suggestions for Application

The suggestion that the use of the NIAI be restricted to experimental programs still stands. Since the sample used here was quite small, and since all validation was mere verification applying the equations back on the same individuals from which the equations were developed, it might be foolhardy to place much confidence in these equations until they have been cross-validated or found to function well in an experimental program. However, if upon cross-validation it was found that the better equations were even half as effective as with this sample, use of the NIAI as a screening device might prove practical.

If the NIAI and these equations are considered for use, it is recommended that the second, third, and fourth classification equations (all three) be used. Then, if the present means of selection were continued long enough and a sample of 100 or so new cases accrued, similar ratings could be applied and the equations cross-validated.

With a continuous criterion and the two-group discriminant function, setting the cutting point on the discriminant score is arbitrary. The arithmetic mean of the two group discriminant scores was used here. For example, if, on the basis of discriminant scores, the top one-third had been selected, 90% of those so selected would have been found to have combined criterion ratings above the median rating. Thus, if there were three persons to choose from each time one instructor was needed, using either equation III or IV, 90% of those selected would earn ratings equivalent to those earned by the upper half of this sample. (This actually assumes too much. It assumes perfect sampling and no loss in classification effectiveness upon cross-validation.) However, this percentage (90%) appears superior to that for the regression equation (74%).

In actual practice, use of the classification equations can be speeded up by rounding down to about one digit in each term. If a discriminant score comes close to the cutting score, then in the special case the full three digit terms can be used to obtain the exact decision determined by the equation.\*

\*For example, equation III may be used as  $\text{TA} + .3 \text{ GA} + .9 \text{ PSE} = \text{Discriminant Score III.}$

It is suggested that when the NIAI is used the verification scales be scored and used to eliminate severe cases of invalid testing before applying classification equations.

#### CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

It may be concluded that the NIAI holds promise of being highly useful in selecting instructors for Naval Air Technical Training Schools or in identifying instructors who may need more supervisory help than others. Its best application seems to lie in its use as a selection device in conjunction with a classification equation.

Another suggestion for further research follows from the fact that the validity investigated here is descriptive and concurrent rather than prognostic or predictive. Descriptive validity is logically conceived as a necessary but not sufficient condition for the instrument to have predictive validity. Thus, to demonstrate predictive validity further research would be necessary in which testing was done at the time of selection and the criterion ratings procured and used sometime later after the instructors have had sufficient time to establish the kind of classroom relationships which typify their teaching and after those who make the ratings have had sufficient time to do so from knowledge necessary for reliable criterion data.

The primary suggestion for further research has already been stated, i.e., obtain a cross-validation on the instrument and the equations. In consideration of the equations developed here, the criterion of the cross-validation should be a replication of the criterion used here. However, if a new criterion is considered it is strongly suggested that naval personnel be consulted extensively in its definition. With a new criterion new classification equations would have to be derived.

#### SUMMARY

An instrument herein called the Navy Instructor Attitude Inventory (NIAI) was constructed. The basis for and the procedures followed in this construction have been cited or described.

A validation study of the NIAI was attempted using a limited sample of 70 instructors and an externally defined criterion. The seven variables of the NIAI and nine others were intercorrelated to observe the relationships of these variables. Six of the NIAI variables were used in a multiple regression problem, resulting in a multiple correlation coefficient ( $R = 0.383$ ) which did not quite attain significance at the five per cent level of confidence. For this, the standard error or estimate was 12.03; the forecasting efficiency only about 7.5% better than chance. This multiple correlation coefficient corrected for "shrinkage" dropped to 0.30.

A prediction equation using the three NIAI content scales and one verification scale (Rare Positive Response or V+ which appeared to function as a "suppressant") was established. Also, a Profile Sheet summarizing the normative data, giving Z-score conversions and a distribution of the Weighted Total Scores (predicted criterion scores) was presented.

It was suggested that use of the NIAI be limited to experimental programs.

Some rationale was given for shifting the emphasis from predicting a specific criterion score to classifying with respect to a decision for accepting or rejecting an applicant. Use of the NIAI was thus envisioned as providing an additional screening device to be used in selecting new instructors or retaining experienced ones.

Four classification equations were developed and briefly interpreted. The first was designed to simulate as closely as possible the situation of multiple regression analysis already presented. The second was similar to the first, also contrasted to another multiple regression analysis, but using one less variable. Also, six cases were rejected because of invalid testing and dropped from the study. The third and fourth classification equations were based on further attempts to purify the criterion, viz. using the Kelley split and selecting criterion groups on basis

of consistent ratings. Classification improved with the development of each equation, except the last in which classification was identical to that just before it. It was noted that the classification equations tend to be more successful with instructors above the median than with those below the median criterion rating. This was interpreted by the hypothesis that perhaps good instructors are more homogeneous than poor ones.

Some suggestions for the use of the NIAI and some of the classification equations were proffered. It was strongly suggested that a cross-validation be done before too much confidence is placed upon the instrument or any of its appended equations.

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## **APPENDIX A**

**DO NOT OPEN UNTIL TOLD TO DO SO**

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# **NAVY INSTRUCTOR ATTITUDE INVENTORY**

**Form NX-1**

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## **DIRECTIONS**

This inventory consists of statements designed to sample your opinions about a variety of people and situations. There are no right or wrong answers. What is wanted is your own individual feeling about the statements. Read each statement and decide how YOU feel about it. Then mark your answers on the space provided on the answer sheet. Do not make any marks on this booklet.

If you strongly agree, blacken space under "SA" . . . . .

If you agree, blacken space under "A" . . . . .

If you are undecided or uncertain, blacken space under "U" . . .

If you disagree, blacken space under "D" . . . . .

If you strongly disagree, blacken space under "SD" . . . . .

SA	A	U	D	SD
■				
SA	A	U	D	SD
	■			
SA	A	U	D	SD
		■		
SA	A	U	D	SD
			■	
SA	A	U	D	SD
				■

Think in terms of the general situation rather than specific ones.

There is no time limit, but work as rapidly as you can. PLEASE RESPOND TO EVERY ITEM.

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
- |  |  |
|--|--|
| 1. Teaching never gets monotonous.   | 16. I frequently have to fight against showing that I am bashful.  |
| 2. In high school, I often felt that my teachers lacked a personal interest in me as an individual.          | 17. At times I feel like swearing.   |
| 3. I enjoy detective or mystery stories.   | 18. Young people today are just as good as those of the past generation.   |
| 4. Increased freedom in the classroom creates confusion.   | 19. One should not expect students to enjoy school.  |
| 5. I often felt "left out" of school social and recreational activities.                                     | 20. I would have been happier in school if just one of my teachers had shown some sympathetic interest towards my school problems. |
| 6. At times I have very much wanted to leave home.   | 21. Most student misbehavior is done to annoy the teacher.   |
| 7. Once in a while I think of things too bad to talk about.  | 22. Most of my teachers in school seemed warm and friendly towards their pupils.   |
| 8. Students should not respect teachers anymore than any other adults.                                       | 23. I am liked by most people who know me.   |
| 9. I sometimes think I kept to myself more than I should have in high school.                                | 24. Teachers can be in the wrong as well as students.  |
| 10. I often think, "I wish I were a child again."  | 25. Most of the subjects I studied in high school seemed a complete waste of time.   |
| 11. There is nothing that can be more irritating than some students.   | 26. I am almost never bothered by pains over the heart or in my chest.   |
| 12. In general I did not dislike my teachers but I must admit I was afraid of many of them.                  | 27. I do not always tell the truth.  |
| 13. When someone does me a wrong I feel I should pay him back if I can, just for the principle of the thing. | 28. Whispering should not be tolerated in the classroom.   |
| 14. A teacher seldom finds young people really enjoyable.  | 29. I often felt I should leave school since I didn't seem to be accomplishing anything.   |
| 15. I would have enjoyed school more had I not been so worried about family matters.                         | 30. As a youngster I was suspended from school one or more times for cutting up.   |

GO ON TO THE NEXT PAGE

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
31. At times I have wished I were a girl.
32. Teachers should exercise more authority over their students than they do.
33. If I had to conform to the same curriculum requirements in high school again, I would be tempted to quit school.
34. I often get discouraged about amounting to something.
35. Young people are usually too sociable in the classroom.
36. I often desired to "play hooky" and do something else rather than go to school.
37. I am certainly lacking in self-confidence.
38. Young people nowadays are too frivolous.
39. My high school principal was a cold, unsympathetic sort of person.
40. Most students are resourceful when left on their own.
41. I think most people would lie to get ahead.
42. Young people are not mature enough to make their own decisions.
43. While in high school I couldn't escape the feeling that I should be out earning money to help my parents instead of staying in school.
44. There is too great an emphasis upon "keeping order" in the classroom.
45. I do not read every editorial in the newspaper every day.
46. In general, I enjoyed school and seldom felt bored or restless.
47. Students should be allowed more freedom in their execution of learning activities.
48. I can say in all truthfulness that while in school I got along quite well with my fellow students.
49. I get angry sometimes.
50. In school I was sometimes sent to the principal for cutting up.
51. All persons should know the fundamentals of English grammar by the first year of high school.
52. The subjects we studied in high school just didn't seem very practical to me.
53. Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it.
54. Once in a while I put off until tomorrow what I ought to do today.
55. The student who misbehaves should be made to feel guilty and ashamed of himself.
56. In high school I had many friends and acquaintances.
57. I believe that my home life is as pleasant as that of most people I know.
58. I disliked my studies in high school.
59. Sometimes I feel as if I must injure either myself or someone else.

GO ON TO THE NEXT PAGE

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
60. Sometimes when I am not feeling well I am cross.
61. One should be able to get along with almost any student.
62. I often felt that I just didn't "belong" while in school.
63. A student who bites his nails needs to be made to feel ashamed.
64. My parents didn't really care whether I finished school or not.
65. Young people will think for themselves if permitted.
66. There is no excuse for the extreme sensitivity of some students.
67. My parents seemed to think I was wasting time in school and should be out earning money.
68. My table manners are not quite as good at home as when I am out in company.
69. Students just cannot be trusted.
70. I am against giving money to beggars.
71. Most students are not interested in learning.
72. While in school I often felt like "chucking it all" and getting a job.
73. I enjoy many different kinds of play and recreation.
74. My parents have often objected to the kind of people I went around with.
75. Minor disciplinary situations should sometimes be turned into jokes.
76. If the teacher laughs with the students in amusing classroom situations, the class tends to get out of control.
77. I should like to belong to several clubs or lodges.
78. While a student it often seemed to me that I would be utilizing my time to greater advantage by working and gaining job experience than by going to school.
79. I hardly ever notice my heart pounding and I am seldom short of breath.
80. If I could get into a movie without paying and be sure I was not seen I would probably do it.
81. A young person's companionships can be too carefully supervised.
82. The first lesson a student needs to learn is to follow the teacher's instructions without hesitation.
83. I never felt I could afford to waste time by participating in school social or recreational activities.
84. I would rather win than lose in a game.
85. A student's failure is seldom the fault of the teacher.
86. I don't blame anyone for trying to grab everything he can get in this world.
87. I can be friendly with people who do things which I consider wrong.
88. A teacher should not be expected to burden himself with a student's problems.

GO ON TO THE NEXT PAGE

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
89. Sometimes at elections I vote for men about whom I know very little.
90. A teacher should not be expected to sacrifice an evening at home in order to confer with a student (or his family).
91. My parents encouraged my school progress and wanted me to finish school.
92. If I were an artist I would like to draw flowers.
93. I like to know some important people because it makes me feel important.
94. Young people should be taught to obey adults without question.
95. In high school, I felt that some of my teachers disliked me.
96. Once in a while I feel hate toward members of my family whom I usually love.
97. I do not like everyone I know.
98. A student should not be required to stand when reciting.
99. I am sure I am being talked about.
100. There is too much emphasis on grading.
101. I work under a great deal of tension.
102. The school is often to blame in cases of truancy.
103. I am so touchy on some subjects that I can't talk about them.
104. Most students would like to use good English.
105. In school I found it very hard to talk before the class.
106. Young people nowadays are allowed too much freedom in school.
107. During one period when I was a youngster I engaged in petty thievery.
108. Most students try to make things easier for the teacher.
109. I think nearly anyone would tell a lie to keep out of trouble.
110. Most teachers do not give sufficient explanation in their teaching.
111. The things that some of my family have done have frightened me.
112. I gossip a little at times.
113. Students should be given more freedom in the classroom than they usually get.
114. It isn't practicable to base school work upon student's interests.
115. Young people are given too much freedom.
116. Sometimes I become so excited that I find it hard to get to sleep.
117. I tend to be on my guard with people who are somewhat more friendly than I had expected.
118. Most students are considerate of their teachers.
119. I have several times given up doing a thing because I thought too little of my ability.
120. I am not easily angered.

GO ON TO THE NEXT PAGE

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
121. Shy students should be required to stand when reciting.
122. As a rule teachers are too lenient with their students.
123. I frequently ask people for advice.
124. Often, even though everything is going fine for me, I feel that I don't care about anything.
125. Young people are so likeable that their shortcomings can usually be overlooked.
126. Once in a while I laugh at a dirty joke.
127. I cannot keep my mind on one thing.
128. It is usually the uninteresting and difficult subjects that will do the student the most good.
129. The student who stutters should be asked to recite more often.
130. Teachers probably over-emphasize the seriousness of such student behavior as the writing of obscene notes.
131. I would certainly enjoy beating a crook at his own game.
132. It would be better if almost all laws were thrown away.
133. Young people act more civilized than do many adults.
134. A student has the right to disagree openly with his teachers.
135. I like or have liked fishing very much.
136. It's the students who actually keep a teacher interested in teaching.
137. I like to read newspaper editorials.
138. There are certain people whom I dislike so much that I am inwardly pleased when they are caught for something they have done.
139. I am often inclined to go out of my way to win a point with someone who has opposed me.
140. I like to poke fun at people.
141. Science has its place, but there are many important things that can never possibly be understood by the human mind.
142. If I were in trouble with several friends who were equally to blame, I would rather take the whole blame than to give them away.
143. While in trains, busses, etc., I often talk to strangers.
144. People can be divided into two distinct classes: the weak and the strong.
145. I usually "lay my cards on the table" with people that I am trying to correct or improve.
146. I think if my health had been better I would have enjoyed school more.
147. The wild sex life of the old Greeks and Romans was tame compared to some of the goings-on in this country, even in places where people might least expect it.
148. People can pretty easily change me even though I thought that my mind was already made up on a subject.
149. I can stand as much pain as others can.

GO ON TO THE NEXT PAGE

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
150. Sometimes I enjoy hurting persons I love.
151. Teachers need to be keen students of human nature.
152. I never attend a sexy show if I can avoid it.
153. Young people's wants are just as important as those of an adult.
154. I am greatly bothered by forgetting where I put things.
155. Most people are pretty easy to get along with.
156. Imaginative tales demand the same punishment as lying.
157. On the whole, the punishment I received as a child was just about right, neither too much nor too little.
158. I very much like horseback riding.
159. Being able to get along with people is the most important asset a person can have.
160. Most students respond well to constructive suggestions.
161. In high school, I had a lot of difficulties with my teachers.
162. In most respects, other people are very much like myself.
163. What a teacher sees in his class is largely determined by what he is.
164. Good teachers are more important to a community than are good doctors.
165. Sometimes it is useless to try to reason with a child.
166. I have little difficulty controlling my temper.
167. I dislike having to explain things to others.
168. It bothers me greatly to violate a confidence.
169. In school, I rarely received high marks in deportment.
170. I frequently get into difficulty through people misunderstanding my intentions.
171. I often feel that people misunderstand me.
172. Learning the names of new acquaintances comes easily for me.
173. I often feel others expect too much of me.
174. I dislike speaking before a group.
175. There are quite a few people who are so irritating it is practically impossible to get along with them.
176. It is often impossible to live up to what others expect of a person.
177. I read the sports section of the paper every chance I get.
178. I ran away from home one or more times before I was 18.
179. Any criticisms I have received from superiors have usually been justified.
180. When given a task to do, I am probably more conscientious than most people in trying to carry it out successfully.
181. I am a big league baseball fan.

GO ON TO THE NEXT PAGE

SA--Strongly agree  
A--Agree

U--Undecided  
or uncertain

D--Disagree  
SD--Strongly disagree

- 
182. I never carry a grudge for very long.
183. In most ways, women are definitely superior to men.
184. There are too many silly laws and regulations for people to live up to.
185. If a person in authority wants to take advantage of others because of his position, that is his privilege.
186. There is hardly anything more satisfying than knowing you have done a job well.
187. Whenever I am criticized, I rarely let any resentment I feel get out of hand.
188. I think I would like teaching as a career.

**APPENDIX B**

NIAI KEYING\*

TA SCALE

Item Number	Responses					Item Number	Responses					Item Number	Responses				
	SA	A	U	D	SD		SA	A	U	D	SD		SA	A	U	D	SD
1.	x	x	o	-	-	69.	-	-	-	-	x	121.	o	-	o	x	o
4.	-	o	o	x	x	71.	-	-	-	o	x	122.	-	-	o	x	x
8.	x	x	-	-	-	75.	x	x	o	o	-	128.	x	x	o	-	-
11.	-	-	o	o	c	76.	-	-	o	x	x	129.	o	-	o	x	o
14.	-	-	-	-	x	82.	o	o	x	x	o	130.	o	x	o	-	-
18.	x	o	-	-	-	85.	o	o	o	x	o	133.	x	x	o	-	-
19.	o	o	o	o	x	88.	o	o	o	o	x	134.	x	x	-	-	-
24.	x	-	-	-	-	90.	o	o	o	x	x	136.	x	o	o	-	o
28.	-	o	o	o	o	94.	o	o	o	o	x	144.	-	-	o	x	o
32.	-	-	o	o	o	98.	x	o	o	o	o	151.	o	o	-	-	-
35.	-	-	o	x	x	100.	x	x	o	-	o	153.	x	o	-	-	-
38.	-	-	o	x	x	102.	x	x	o	-	-	156.	-	-	-	-	x
40.	o	o	o	-	-	104.	x	x	o	-	-	163.	o	x	o	-	-
44.	x	x	o	o	-	106.	-	-	o	x	x	164.	o	o	o	-	o
47.	x	x	o	-	-	108.	x	x	o	-	-	165.	o	x	-	-	o
51.	x	x	-	-	-	110.	x	x	o	-	-	167.	-	-	o	x	x
55.	-	-	o	o	x	113.	x	x	o	o	-	174.	-	o	o	x	x
61.	x	o	-	-	-	114.	o	o	o	o	x	185.	-	-	-	x	x
63.	-	-	-	x	x	115.	-	o	o	x	x	186.	x	x	o	o	o
65.	x	x	o	-	-	118.	x	x	o	-	-	188.	x	x	o	o	-
66.	-	-	o	o	x												

GA SCALE

Item Number	Responses					Item Number	Responses					Item Number	Responses				
	SA	A	U	D	SD		SA	A	U	D	SD		SA	A	U	D	SD
3.	x	x	o	-	-	111.	-	-	-	o	o	152.	-	-	o	o	o
6.	x	x	o	-	-	116.	-	-	o	x	x	154.	-	-	-	o	o
10.	-	-	o	o	o	117.	x	x	o	-	-	155.	o	o	o	-	-
13.	-	-	o	x	x	119.	-	-	-	x	x	158.	x	x	o	o	o
26.	x	x	-	-	-	120.	x	x	o	-	-	159.	x	x	o	o	o
31.	-	-	-	x	x	123.	o	o	o	-	-	162.	o	o	-	-	-
34.	-	-	-	x	x	124.	-	-	-	x	x	166.	x	x	o	-	-
37.	-	-	-	o	o	127.	-	-	-	o	o	168.	o	o	-	-	-
41.	o	o	o	x	x	131.	-	o	o	x	o	170.	-	-	o	o	o
53.	-	-	o	x	x	132.	-	-	-	o	o	171.	-	-	o	o	o
57.	o	o	-	-	-	135.	x	x	o	o	o	172.	x	x	o	o	o
59.	-	-	-	x	x	137.	x	x	o	o	o	173.	-	-	o	o	o
70.	-	-	-	x	x	138.	-	o	o	x	o	175.	-	-	o	o	o
73.	x	x	-	-	-	139.	o	x	o	-	-	176.	o	o	o	x	x
77.	x	x	o	-	-	140.	-	-	-	x	x	177.	x	x	o	o	o
86.	-	-	-	x	x	141.	x	o	-	o	o	178.	-	-	-	o	o
87.	x	x	-	-	-	142.	x	x	o	-	-	179.	o	o	-	-	-
92.	o	x	o	o	o	143.	x	x	-	-	-	180.	o	o	o	-	-
96.	-	-	o	x	x	145.	o	o	o	-	-	181.	x	x	o	o	o
99.	-	-	-	x	x	147.	o	-	x	o	o	182.	o	o	o	-	-
101.	-	-	-	x	x	148.	-	-	-	o	o	183.	-	-	o	o	o
103.	-	-	-	x	x	149.	o	o	o	-	-	184.	-	-	o	o	o
109.	-	-	o	x	x	150.	-	-	-	o	o	187.	o	o	-	-	-

\*Scoring is as follows: x = plus one, - = minus one, and o = no score.

PSE SCALE

Item Responses						Item Responses						Item Responses					
Number	SA	A	U	D	SD	Number	SA	A	U	D	SD	Number	SA	A	U	D	SD
2.	-	-	o	x	x	39.	-	-	o	x	x	74.	-	-	-	x	x
5.	-	-	o	x	x	43.	-	-	-	x	x	78.	-	-	-	x	x
9.	-	-	o	x	x	46.	x	x	o	-	-	83.	-	-	-	x	x
12.	-	-	o	o	o	48.	x	x	-	-	-	91.	x	x	-	-	-
15.	-	-	o	o	o	50.	o	o	o	x	x	95.	-	-	o	o	o
20.	-	-	-	o	o	52.	-	-	-	x	x	105.	-	-	o	x	x
22.	x	x	o	-	-	56.	x	x	-	-	-	107.	o	o	o	x	x
25.	-	-	-	x	x	58.	-	-	-	x	x	146.	-	-	-	o	o
29.	-	-	-	x	x	62.	-	-	-	x	x	157.	o	o	o	-	-
30.	-	-	-	x	x	64.	-	-	-	x	x	161.	-	-	-	x	x
33.	-	-	-	x	x	67.	-	-	-	x	x	169.	-	-	o	x	x
36.	-	-	o	x	x	72.	-	-	-	x	x						

V+ SCALE

Item Responses						Item Responses						Item Responses					
Number	SA	A	U	D	SD	Number	SA	A	U	D	SD	Number	SA	A	U	D	SD
3.	x	o	o	o	o	87.	x	o	o	o	o	124.	o	o	o	o	x
4.	o	o	o	x	x	92.	o	x	o	o	o	125.	x	o	o	o	o
6.	x	o	o	o	o	93.	x	o	o	o	o	128.	x	o	o	o	o
22.	x	o	o	o	o	94.	o	o	o	o	x	136.	x	o	o	o	o
23.	x	o	o	o	o	101.	o	o	o	o	x	137.	x	o	o	o	o
36.	o	o	o	o	x	102.	x	o	o	o	o	140.	o	o	o	o	x
41.	o	o	o	o	x	105.	o	o	o	o	x	142.	x	o	o	o	o
42.	o	o	o	o	x	106.	o	o	o	o	x	143.	x	o	o	o	o
44.	x	o	o	o	o	108.	x	o	o	o	o	156.	o	o	o	o	x
53.	o	o	o	o	x	109.	o	o	o	o	x	158.	x	o	o	o	o
70.	o	o	o	o	x	113.	x	o	o	o	o	166.	x	o	o	o	o
77.	x	o	o	o	o	115.	o	o	o	o	x	167.	o	o	o	o	x
79.	x	o	o	o	o	116.	o	o	o	o	x	172.	x	o	o	o	o
82.	o	o	x	o	o	117.	x	o	o	o	o	174.	o	o	o	o	x
83.	o	o	o	o	x	120.	x	o	o	o	o	176.	o	o	o	o	x
86.	o	o	o	o	x	122.	o	o	o	o	x	188.	x	o	o	o	o

V- SCALE

Item Responses						Item Responses						Item Responses					
Number	SA	A	U	D	SD	Number	SA	A	U	D	SD	Number	SA	A	U	D	SD
2.	-	o	o	o	o	18.	o	o	o	o	-	32.	-	o	o	o	o
3.	o	o	o	o	-	20.	-	o	o	o	o	33.	-	-	-	o	o
5.	-	-	o	o	o	21.	-	o	o	o	o	34.	-	o	-	o	o
8.	o	o	o	o	-	22.	o	o	o	-	-	35.	-	o	o	o	o
9.	-	o	o	o	o	23.	o	o	o	-	-	36.	-	o	o	o	o
10.	-	o	o	o	o	24.	o	o	-	-	-	37.	-	-	-	o	o
11.	-	o	o	o	o	25.	-	-	-	o	o	38.	-	o	o	o	o
12.	-	-	o	o	o	26.	o	o	-	o	o	39.	-	-	o	o	o
13.	-	o	o	o	o	27.	x	o	o	o	-	40.	o	o	o	o	-
14.	-	-	-	o	o	29.	-	-	-	o	o	42.	-	o	o	o	o
15.	-	-	o	o	o	30.	-	o	-	o	o	43.	-	o	-	o	o
16.	-	o	o	o	o	31.	-	-	-	o	o	47.	o	o	o	o	-

V- SCALE (Cont'd.)

Item Number	Responses					Item Number	Responses					Item Number	Responses				
	SA	A	U	D	SD		SA	A	U	D	SD		SA	A	U	D	SD
48.	o	o	-	-	-	91.	o	o	-	-	-	143.	o	o	-	o	-
49.	o	o	-	-	-	94.	-	o	o	o	o	144.	-	o	o	o	o
51.	o	o	-	-	-	95.	-	o	o	o	o	145.	o	o	o	o	-
52.	-	o	-	o	o	96.	-	o	o	o	o	146.	-	-	-	o	o
53.	-	o	o	o	o	98.	o	o	o	o	-	148.	-	o	-	o	o
54.	o	o	-	-	-	101.	-	o	-	o	o	149.	o	o	o	-	-
55.	-	o	o	o	o	102.	o	o	o	o	-	150.	-	-	-	o	o
56.	o	o	-	-	-	103.	-	-	-	o	o	151.	o	o	o	-	-
57.	o	o	-	-	-	104.	o	o	o	o	-	152.	-	-	o	o	o
58.	-	-	-	o	o	105.	-	o	o	o	o	153.	o	o	-	-	-
59.	-	-	-	o	o	107.	o	o	o	o	-	154.	-	o	-	o	o
60.	o	o	-	-	-	108.	o	o	o	o	-	155.	o	o	-	-	-
61.	o	o	-	o	-	109.	-	o	o	o	o	156.	-	o	o	o	o
62.	-	-	-	o	o	110.	o	o	o	o	-	157.	o	o	o	-	-
63.	-	o	o	o	o	111.	-	o	-	o	o	160.	o	o	o	-	-
64.	-	-	-	o	o	115.	-	o	o	o	o	161.	-	-	-	o	o
65.	o	o	o	o	-	116.	-	o	o	o	o	162.	o	o	o	-	-
66.	-	-	o	o	o	117.	o	o	o	o	-	163.	o	o	o	o	-
67.	-	-	-	o	o	118.	o	o	o	o	-	165.	o	o	-	o	o
69.	-	-	-	o	o	119.	-	o	-	o	o	166.	o	o	o	o	-
70.	-	o	o	o	o	120.	o	o	o	o	-	167.	-	-	o	o	o
71.	-	o	o	o	o	122.	-	o	o	o	o	168.	o	o	o	-	-
72.	-	o	-	o	o	123.	o	o	o	o	-	169.	-	o	o	o	o
73.	o	o	-	-	-	124.	-	o	o	o	o	170.	-	o	o	o	o
74.	-	o	-	o	o	125.	o	o	o	o	-	171.	-	o	o	o	o
76.	-	o	o	o	o	127.	-	o	-	o	o	173.	-	-	o	o	o
77.	o	o	o	o	-	128.	o	o	o	o	-	174.	-	o	o	o	o
78.	-	o	-	o	o	132.	-	-	-	o	o	175.	-	o	o	o	o
79.	o	o	o	o	-	133.	o	o	o	o	-	178.	-	o	-	o	o
81.	o	o	o	o	-	134.	o	o	o	o	-	179.	o	o	o	-	-
82.	-	o	o	o	o	136.	o	o	o	-	o	180.	o	o	o	o	-
83.	-	-	-	o	o	138.	-	o	o	o	o	182.	o	o	o	o	-
85.	-	o	o	o	o	139.	o	o	o	o	-	183.	-	o	o	o	o
86.	-	o	o	o	o	140.	-	o	o	o	o	185.	-	-	-	o	o
87.	o	o	-	-	-	142.	o	o	o	o	-	187.	o	o	-	-	-
90.	-	o	o	o	o												

Vo SCALE

Item Number	Responses					Item Number	Responses					Item Number	Responses				
	SA	A	U	D	SD		SA	A	U	D	SD		SA	A	U	D	SD
1.	x	x	o	x	x	36.	x	x	o	x	x	93.	x	x	x	x	o
3.	x	x	o	x	x	46.	x	x	o	x	x	95.	x	x	o	x	o
5.	x	x	o	x	x	50.	o	x	o	x	x	100.	x	x	x	x	o
9.	x	x	o	x	x	60.	o	x	x	x	x	105.	x	x	o	x	x
10.	x	x	o	x	x	75.	x	x	o	x	x	107.	o	x	o	x	x
12.	x	x	o	x	x	76.	x	x	o	x	x	114.	o	x	x	x	x
16.	x	x	o	x	x	82.	x	x	x	x	o	116.	x	x	o	x	x
19.	o	o	o	x	x	85.	x	x	o	x	o	121.	o	x	x	x	x
27.	o	x	o	x	x	88.	o	x	o	x	x	123.	o	x	o	x	x
28.	x	x	o	x	o	92.	o	x	x	x	x	127.	x	x	x	x	o

Vo SCALE (Cont'd.)

Item Number	Responses					Item Number	Responses					Item Number	Responses				
	SA	A	U	D	SD		SA	A	U	D	SD		SA	A	U	D	SD
129.	o	x	x	x	o	149.	o	x	x	x	x	173.	x	x	x	x	o
130.	o	x	x	x	x	154.	x	x	x	x	o	174.	x	x	o	x	x
131.	x	x	x	x	o	157.	o	x	x	x	x	175.	x	x	o	x	o
135.	x	x	o	x	o	159.	x	x	x	o	o	176.	o	x	x	x	x
136.	x	x	x	x	o	160.	o	x	o	x	x	177.	x	x	o	x	o
137.	x	x	o	x	o	162.	o	x	x	x	x	180.	o	x	x	x	x
138.	x	x	x	x	o	163.	o	x	x	x	x	181.	x	x	o	x	o
139.	o	x	x	x	x	164.	o	x	x	x	o	182.	x	x	o	x	x
141.	x	x	x	x	o	165.	o	x	x	x	o	184.	x	x	o	x	o
144.	x	x	x	x	o	167.	x	x	o	x	x	186.	x	x	o	o	o
145.	o	x	x	x	x	170.	x	x	x	x	o	187.	o	x	x	x	x
147.	o	x	x	x	o	171.	x	x	x	x	o	188.	x	x	o	x	x
148.	x	x	x	x	o	172.	x	x	o	x	o						

L SCALE

Item Number	Responses					Item Number	Responses					Item Number	Responses				
	SA	A	U	D	SD		SA	A	U	D	SD		SA	A	U	D	SD
7.	o	o	o	o	x	54.	o	o	x	x	x	89.	o	o	o	o	x
17.	o	o	x	x	x	60.	o	o	x	x	x	93.	o	o	o	o	x
27.	o	o	x	x	x	68.	o	o	x	x	x	97.	o	o	x	x	x
45.	o	o	x	x	x	80.	o	o	o	o	x	112.	o	o	x	x	x
49.	o	o	x	x	x	84.	o	o	x	x	x	126.	o	o	x	x	x

**APPENDIX C**

SCORES LISTED BY INSTRUCTOR

Instructor Number	TA	GA	PSE	V+	V-	Vo	L	Y*
1.	51	53	69	1	11	8	1	62
2.	62	67	70	2	7	6	6	103
3.	62	67	74	0	1	5	1	101
4.	47	64	74	3	5	5	2	103
5.	47	61	67	1	7	9	2	103
6.	58	79	79	7	2	3	3	85
7.	39	48	66	1	13	5	0	99
8.	58	37	46	1	20	5	2	101
9.	59	59	68	1	6	4	2	80
10.	57	56	45	0	17	3	2	104
11.	39	52	67	1	13	7	2	113
12.	50	56	56	1	8	5	3	82
13.	54	67	69	0	10	1	3	115
14.	35	49	51	1	17	4	1	92
15.	71	69	66	4	3	3	4	87
16.	32	60	52	3	22	9	2	105
17.	42	58	64	0	11	4	2	100
18.	59	50	71	0	5	6	1	97
19.	59	66	73	5	4	14	2	112
20.	52	57	72	0	6	1	1	86
21.	44	73	77	0	0	0	0	103
22.	58	66	72	3	6	0	1	113
23.	56	64	77	13	11	13	9	98
24.	37	25	34	1	45	24	5	68
25.	53	45	72	1	7	7	4	122
26.	62	69	78	8	3	6	1	59
27.	64	42	61	2	9	1	2	113
28.	45	35	68	1	10	1	2	93
29.	46	56	70	4	9	6	0	79
30.	68	64	64	3	5	3	1	108
31.	53	65	73	1	2	2	1	124
32.	42	34	46	0	19	6	0	92
33.	64	65	74	1	0	1	0	103
34.	57	75	70	1	2	0	0	115
35.	52	55	58	0	8	3	0	103
36.	50	54	65	4	9	6	1	77
37.	71	62	71	1	7	4	1	121
38.	49	61	66	1	6	1	1	101
39.	53	65	60	1	11	12	1	106
40.	57	62	71	0	9	2	0	118
41.	67	62	67	5	3	3	1	107
42.	53	61	69	0	4	0	1	97
43.	60	68	64	1	3	0	1	106
44.	79	59	75	6	4	7	3	104
45.	52	70	67	0	6	2	2	114
46.	63	39	49	2	19	4	0	93
47.	50	44	46	0	16	5	0	79
48.	50	58	75	0	3	3	0	115
49.	48	67	72	0	3	0	1	107
50.	48	43	64	2	15	6	1	95
51.	60	59	65	3	9	9	0	99
52.	44	50	65	1	8	4	0	99

\*Criterion (combined ratings)

SCORES LISTED BY INSTRUCTOR (Cont'd.)

Instructor Number	TA	GA	PSE	V+	V-	Vo	L	Y*
53.	36	60	59	0	20	5	1	93
54.	65	72	74	4	2	3	0	96
55.	60	75	76	1	3	3	0	95
56.	62	58	69	0	10	5	3	114
57.	74	59	72	2	4	5	0	120
58.	39	45	50	0	16	12	0	100
59.	37	73	76	9	10	9	4	103
60.	48	66	77	0	2	2	4	97
61.	60	62	52	5	12	7	2	109
62.	62	66	72	0	2	1	2	107
63.	61	57	74	1	5	2	0	105
64.	56	67	75	16	7	13	8	105
65.	45	55	56	7	12	4	0	101
66.	52	54	65	0	8	5	0	96
67.	60	64	72	1	4	1	1	108
68.	52	67	70	0	3	3	2	96
69.	46	64	47	4	14	7	0	80
70.	60	56	69	3	12	6	0	103

\*Criterion (combined ratings)